BEDSIDE MEDICINE FOR BEDSIDE DOCTORS

An Open Forum for brief discussions of the workaday problems of the bedside doctor. Suggestions of subjects for discussions invited.

ARTIFICIAL PNEUMOTHORAX

JOHN W. NEVIUS, M. D. (1002 Wilshire Medical Building, Los Angeles).—"No more hopeful ray of sunshine has ever come to illumine the dark kingdoms of disease than that introduced into the path of the consumptive through the discovery of artificial pneumothorax." Anyone who has given this treatment a fair trial knows how true are these words of Riviere. There is scarcely a more astounding change seen in medical practice than that often seen in patients receiving this treatment. The results are not only astounding, they are frequently almost miraculous. In the writer's opinion, it is the greatest step forward that has ever been made in the treatment of pulmonary tuberculosis. That it is also valuable in other diseases of the lungs has been shown very clearly by Doctor Brown and Doctor Faulkner.

I know of nothing more spectacular and correspondingly gratifying than to see a patient who is extremely ill from tuberculosis, with high fever, rapid pulse, racking cough and marked weakness, change within a week (as they sometimes do after receiving this treatment) to become a patient with normal temperature, no cough and a feeling of enthusiastic well-being, and a renewed hope of recovery. This regained assurance is in itself a big help. There is perhaps no disease in which the patient's morale has a greater physical effect than in tuberculosis. Hopefulness has a real therapeutic value.

What a contrast this is to the old method, where a patient went through months of confinement in bed, with all the anxiety and terror, and often despair, which this disease inspires; with the worry about the expense of treatment, the loss of income, and the drain on the rest of the family (factors which often greatly retard the patient's progress); with the grief and worry on the part of the relatives; and finally, the economic loss caused by withdrawing the patient and often an attendant from their occupations.

What a difference it makes for the patient to be able to go back to work and be self-supporting instead of having to be a burden. For often, when a satisfactory collapse is obtained in an early case, the patient is able to go back to work in a few weeks. Indeed, some patients need to leave work for only the first two weeks. To obtain such striking results one should get the patient at the ideal time for collapse, that is, in the early stage before adhesions form.

Unfortunately we often wait too long before doing pneumothorax operations, and adhesions do form and hinder collapse. Naturally, in these cases the results are less spectacular, though they are usually good even then, but of course much more slowly obtained.

Many remarkable cures take place even in far advanced cases, sometimes even with extensive pathologic changes in the better lung. Even though the disease be too far advanced to obtain a cure, marked improvement and added months, or even years, of life may be obtained.

It is in these advanced patients that hemorrhage most frequently occurs. Here again, the miraculous results of pneumothorax are strikingly manifest. Cases in which every other remedy used for hemorrhage has failed, respond at once to pneumothorax when collapse can be obtained. Even with only partial collapse hemorrhage is often controlled.

While less spectacular, pneumothorax is no less valuable to society in those patients who are throwing off incalculable numbers of bacilli in their sputum. By collapsing the lung and checking this sputum a prolific source of infection is obliterated. That in itself is a great accomplishment. If every patient who has tuberculosis could be collapsed early and thus the human source of infection be eliminated, we would be far on our way toward the complete eradication of tuberculosis.

In the writer's opinion, it is a pity that so few tuberculous patients are being given the benefits of this marvelous therapeutic agent. There should be hundreds, nay thousands, where today there is one. Every case of pulmonary tuberculosis should be carefully considered as a possible candidate for this most promising method of treatment—artificial pneumothorax.

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A. LINCOLN BROWN (490 Post Street, San Francisco).—Although the production of an artificial pneumothorax has probably found its most common therapeutic use in the treatment of pulmonary tuberculosis, it has also become a most valuable measure in thoracic surgery in general.

First, it may be used therapeutically in such conditions as pulmonary tuberculosis, bronchiectasis and lung abscess. Doctor Nevius has well outlined its value in tuberculosis. Its value in cases of bronchiectasis is at present a somewhat moot question. The consensus of opinion appears to be that it is of considerable value in early cases, especially in children, but that it is of little avail in the chronic well-established forms of this disease. A considerable percentage of lung abscess cases are amenable to treatment with artificial

pneumothorax. In justice to the patient as well as to the procedure, these cases must be carefully chosen. Generally speaking, the cases in which benefit may be expected are rather early lesions (about one month old) in which compression of the abscess is possible both in regard to its location in the lung parenchyma, the elasticity of the abscess walls and the possibility of emptying the cavity of its contents by means of the compression.

Second, artificial pneumothorax finds another use in the control of pulmonary hemorrhage. Such hemorrhage may be either the result of pulmonary disease (*i. e.*, the erosion of vessels in pulmonary tuberculosis, abscess, bronchiectasis, or gangrene) or it may be brought on by direct trauma (for example, most commonly gunshot or stab wounds in the chest). Compression therapy is often a relatively simple but still markedly effective method for the control of hemorrhage in such cases.

Again, in the realm of diagnosis one finds a use for artificial pneumothorax. Thus a "diagnostic pneumothorax" may be induced for a variety of purposes extending from the simple question of determining the presence and extent of pleural adhesions to the better roentgenologic demonstration of intrathoracic neoplasms. Here one is frequently astounded by the different roentgen picture obtained and, consequently, a totally different impression may be gained after the pneumothorax has been induced. Thereby false opinions are corrected and true diagnosis obtained.

Perhaps it is worth while mentioning that on occasions artificial pneumothorax is employed not only alone, but also after such other compression therapy has been induced. Thus the combination of phrenic avulsion and simultaneous pneumothorax is often carried out. And we may continue an artificial pneumothorax after certain forms of thoracoplasty.

In a limited group of cases a "selective collapse" by means of artificial pneumothorax may be obtained. By "selective collapse" is meant the local compression of the lung in a desired area. This of course can only be accomplished by a most careful regulation of the intrapleural pressure in an area not fixed by adhesions and in which the pulmonary tissue is less resistant than the healthy neighboring lung.

Here, as in all branches of thoracic surgery, when the question of the induction in artificial pneumothorax arises, I believe most sincerely in the closest harmony between internist and the surgeon. By such coöperation, and only thus, can the full advantage of this relatively simple and valuable procedure be obtained. Their combined opinion is needed not only to determine whether or not artificial pneumothorax should be induced, but is of equal importance in deciding how great a compression is desired, how long it should be maintained, and when it may be released or when other measures are indicated.

WILLIAM B. FAULKNER, JR., M. D. (University Hospital, San Francisco), and EDWARD C. FAULKNER, M. D. (Saint Mary's Hospital, San Francisco).—Artificial pneumothorax, the introduction of air into the pleural cavity in the treatment of pulmonary tuberculosis, has proved its worth when the cases were carefully selected. But such is not the sole usefulness of pneumothorax; it can be used in the treatment of other pulmonary diseases, and is of especial value in the accurate diagnosis of intrathoracic conditions.

Since rational therapy depends on an understanding of the exact location and nature of the disease, we shall consider first the diagnostic value of pneumothorax and then its use in treatment. The usefulness of diagnostic pneumothorax rests on three factors, namely, the ability of the air in the pleural cavity to displace the lung and mediastinal structures; the changes in the position of the air following changes in the posture of the patient; and the effect of respiration upon the lung and mediastinum.

In patients with pulmonary tuberculosis, pulmonary abscesses or bronchiectasis, it is important to know in which cases pneumothorax should be employed as therapy. This decision is based in a large measure on the presence or absence of pleural adhesions, the site and extent of these adhesions, and their influence on the underlying lung lesion. Such information cannot always be obtained from physical signs or roentgen examination, but is to be had following the initial diagnostic pneumothorax. This indicates whether the patient is likely to be cured by conservative treatment, whether supplementary minor surgical measures are needed, or whether a major thoracic surgical procedure is to be chosen. By means of diagnostic pneumothorax, this information is obtained early enough in the course of the disease so that patients who have a chance of cure by conservative measures are not subjected to surgery, and the others for whom surgery is warranted are not carried along on conservative treatment until they are no longer good surgical risks.

The ability of the air to alter its position with changes in the posture of the patient is helpful in the study of empyemas and injuries of the diaphragm. In patients with empyema, we are able to determine the presence or absence of multiple pockets, the extent and location of each, the possibility of communications between these pockets, and the most desirable site for dependent adequate drainage. When the diaphragm is torn the air will find its way from the pleural into the peritoneal cavity.

Pneumothorax plays an important rôle in the accurate differential diagnosis of intrathoracic tumors. Those involving the pleura are not altered in position either by the air in the pleural cavity or by respiration, whereas lung tumors are displaced by the air. The direction of the displacement is dependent on the posture of the patient. When the lung is pushed away from the mediastinum, tumors of the latter can be localized readily. In addition, there is a respiratory shift of the mediastinum and mediastinal tumors

toward the pneumothorax side on inspiration and in the opposite direction on expiration; but the tumor usually does not move upward or downward. We have had no case of diaphragmatic tumor in our series, but it seems almost certain that such a tumor could be diagnosed following the introduction of air into the pleural cavity. With the employment of the Trendelenburg position, air would collect in the region of the diaphragm, displace the lower lobe upward, and the tumor should stand out clearly.

The notoriously difficult problem of differentiating diseases in the region of the diaphragm is well appreciated; and it is at times impossible to say with certainty from the usual tests whether the involvement is above or below the diaphragm. In these cases diagnostic pneumothorax is occasionally of assistance. It permits a study of the diaphragm, pleura, and lower lobe. In two patients who were proved to have subphrenic abscesses the pneumothorax caused sharp, severe pain over the liver. This pain is significant in making the diagnosis.

Generally speaking, when intrathoracic surgery is contemplated it is important to know in advance concerning the extent of pleural adhesions and the amount of fixation of the mediastinum, because these factors determine not only the likelihood and danger of an open pneumothorax, but also the possibility of a mediastinal flutter. Diagnostic pneumothorax furnishes this information. Accordingly, the surgeon is enabled to select the proper anesthetic and the most suitable operation to avoid these difficulties. The same applies to operations upon the esophagus. Too often one selects empirically between the transpleural and the mediastinal approach without giving due attention to the factors determining which of these is technically possible and best suited to the individual patient. Whenever the air demonstrates an absence of pleural adhesions, the transpleural route is possible and the approach is easy; but with an obliterated pleural cavity, exposure would be difficult by the transpleural operation and in such instances the posterior mediastinal approach would seem desirable. This information can be had in advance of the operation and plans made for the proper surgical management of the patient under consideration.

Let us now turn our attention to the therapeutic use of pneumothorax. The effectiveness of this treatment is based on the compression of the lung, the approximation of the walls of the cavity, the evacuation of pus, the closure of open lesions, the control of pulmonary hemorrhages, and the allowance of local pulmonary rest. These measures aid in healing. Naturally, the treatment is most successful with patients in whom there are no pleural adhesions; but the results are at times very satisfactory even in patients with a few adhesions. Nothing can be expected from pneumothorax treatment if the pleural cavity is completely, or almost completely, obliterated by adhesions, and this will have been determined in advance by the diagnostic pneumothorax. If the adhesions in the upper portion of the thoracic cage and at the diaphragm prevent a satisfactory collapse, the phrenic nerve should be sectioned or avulsed. This will check the diaphragmatic movement and the unfavorable respiratory tug of the diaphragm upon the cavity. Pneumothorax may be continued then with good results. Attention should be directed also to the occasional patient who shows increase in fever and toxicity following the induction of the pneumothorax. When this cannot be accounted for by the presence of pleural fluid, we must consider the possibility of a kinked or otherwise obstructed bronchus. At times, relief can be obtained by withdrawing a portion of the air. These general principles apply to the treatment of pulmonary tuberculosis, pulmonary abscess, and bronchiectasis. In the latter two conditions, pneumothorax should be preceded by a bronchoscopic examination to rule out the possibility of an intrabronchial foreign body or tumor as the underlying cause of the condition. Likewise a bronchoscopic treatment is essential to establish the patency of the diseased bronchus. Drainage is essential, and if the bronchus which leads from the diseased area is not open the pus will not be evacuated but will spread toward the periphery and likely result in an empyema. We believe that many of the cases of empyema that have been reported following the pneumothorax treatment of pulmonary abscesses are attributable to the failure to establish adequate intrabronchial drainage. No empyemas have occurred in our series of pulmonary abscesses following diagnostic or therapeutic pneumothorax.

Treatment of Bone and Joint Tuberculosis.—According to Dale, the modern conception of the pathologic changes in bone and joint tuberculosis divides the treatment of the disease into two equally important parts. The lesion in the bone or joint is regarded as being secondary (with the exception of a few cases of direct infection) to a lesion elsewhere, usually in the lymph nodes, often hidden from view, as in the bracheobronchial or retroperitoneal groups. The spread to the bone or joint takes place by the blood stream, the tubercle bacilli reaching the circulation by way of the lymphatics. The patient must be viewed in a dual light. He is suffering from a general tuberculous infection and a localized tuberculous lesion. The latter is a local manifestation of the former. Treatment that aims at correcting the local condition, while disregarding the general infection, is necessarily unsound. The two must be treated simultaneously and with equal persistence. Even the complete eradication of the local focus, by excision or amputation, does not cure the patient. If treatment of this general condition is not continued, the persistence of the general infection may manifest itself in a further local outbreak.—*Edinburgh Medical Journal.*

Origin of Tumors.—According to Lockhart-Mummery, the essential difference between a normal cell and a tumor cell is one of behavior, not of apparent structure. The tumor cell grows faster than the normal cell. There are two kinds of reproduction—that which produces a new individual, and that which results in the replacement of injured or worn out cells in the tissues. All cells, both germ cells and somatic cells, breed true to their parent cells, and this breeding is controlled by the genes in their nuclei. Changes or mutations of the genes in the nuclei may occur, and, when they do, the daughter cells will always breed true to the mutation. Tumors are the result of a mutation of the genes controlling division of somatic cells.—*British Medical Journal.*